Standard Specification for Corrugated and Solid Fiberboard Sheet Stock (Container Grade) and Cut Shapes- Testing Equipment

Description

7. **Physical Requirements**
   7.1 Corrugated Fiberboard:
   7.1.1 Domestic and Domestic/Fire Retardant Classes, All Varieties:
   7.1.1.1 Facingsâ€”The facings shall conform to the requirements in Table 1 when tested as specified in 9.1.2.
   7.1.1.2 Corrugating Mediumâ€”The corrugating medium for the domestic/fire retardant classes of corrugated fiberboard shall weight not less than 26 lb/1000 ft2 [127 g/m2], or as specified, when tested in accordance with 9.1.2.

TABLE 1 Type CF (Corrugated Fiberboard), Domestic (D) and Domestic/Fire Retardant Classes (D/FR)

NOTE—Select either burst strength or edge crush strength requirement. (While a choice of either burst or edge crush fiberboard is acceptable, their performance may not be equivalent. Refer to 4.1 and 7.1.1.3.)

Part A
Burst or Puncture Strength Related Requirements

Variety	Combined Weight Facings Only, min	Bursting Strength, Dry, min[A]
	lb/1000 ft² [g/m²]	psi [kPa]
SW	52 [254]	125 [862]
SW	66 [322]	150 [1034]
SW	75 [366]	175 [1207]
SW	84 [410]	200 [1379]
SW	111 [542]	250 [1724]
SW	138 [674]	275 [1896]
SW	180 [879]	350 [2413]
DW	92 [449]	200 [1379]
DW	110 [537]	275 [1896]
DW	126 [615]	350 [2413]
DW	180[879]	400[2758]
DW	222[1084]	500 [3447]
DW	270[1318]	600 [4137]

Variety	Grade		Puncture[B]	
			in.-oz/inches of tear	(J)
TW	700	168 [820]	700	[21]
TW	900	222 [1084]	900	[27]
TW	1100	264 [1289]	1100	[33]
TW	1300	360 [1758]	1300	[39]

Part B
Edge Crush Strength Requirements

Variety	Edge Crush Strength min[C] lb/in. [kN/m]
SW	23 [4.0]
SW	26 [4.6]
SW	29 [5.1]
SW	32 [5.6]
SW	40 [7.0]
SW	44 [7.7]
SW	55 [9.6]
DW	42 [7.4]
DW	48[D] [8.4]
DW	51[D] [8.9]
DW	61[D] [10.7]
DW	71[D] [12.4]
DW	82[D] [14.4]

[A] Only one burst of the initial six may fall beneath the minimum required. Domestic board and domestic fire/retardant failing to pass this test will be accepted if, in a retest consisting of 24 bursts (12 from each side of the board), not more than 4 bursts fall below the minimum value required.

[B] A minimum of four puncture tests, conducted in accordance with TAPPI T 803 must be made and only one puncture test will be permitted to fall below the specified minimum value.

[C] Only one edge crush test of the initial six may fall below the minimum required, and that one test cannot fall below the specified minimum value by more than 10 %. Domestic board and domestic fire/retardant failing to pass this test will be accepted if, in a retest consisting of 24 edge crush tests, not more than 4 crush test results fall below the minimum value, and none of those tests fall below the specified minimum value by more than 10 %.

[D] Values subject to confirmation.

7.1.1.3 End Itemâ€”Domestic and domestic/fire retardant classes of corrugated fiberboard, constructed as specified in 6.4, shall conform to the requirements in Table 1 for bursting strength or puncture resistance or edge crush (as specified) when tested as specified in 9.1.3, 9.1.5, or 9.1.8. (See compliance statement following Table 1 for Burst and Edge Crush.)
7.1.2 Weather-Resistant and Weather-Resistant/Fire Retardant Classesâ€”The components and end items conform to the applicable basis weight and bursting strengths specified in Table 2 when tested as specified in 9.1.2, 9.1.5 and 9.2.

7.1.3 Water and Water Vapor-Resistant and Water- and Water Vapor-Resistant/Fire Retardant Classes:
7.1.3.1 Componentsâ€”The components shall conform to the applicable requirements as specified in Table 2 and 6.1.1.1, when tested as specified in 9.1.2. The corrugating medium for the water and water vapor-resistant, and water and water vapor-resistant/fire retardant classes of corrugated fiberboard shall weigh not less than 30 lb/1000 ft2 (146 g/m2), or as specified, when tested in accordance with 9.1.2.
7.2 Type SF (Solid Fiberboard):
7.2.1 Class Domestic and Domestic/Fire Retardant:
7.2.1.1 Facings and Filler Pliesâ€”The combined weights of the facings and filler plies shall conform to the requirements in Table 3 when tested as specified in 9.1.2.
7.2.1.2 End Itemâ€”Domestic and domestic/fire retardant classes of solid fiberboard constructed as specified in 6.5.1 shall conform to the bursting strength requirements in Table 3, when tested as specified in 9.1.5.
7.2.1.3 Weather-Resistant and Weather Resistant/Fire Retardant Class, All Gradesâ€”The weather-resistant solid fiberboard shall conform to the requirements in Table 4, when tested as specified in 9.1.1, 9.1.5 and 9.2.
7.3 Dimensionsâ€”Sheet and pad sizes, and shape dimensions shall be as specified in 7.3.1.4.
7.3.1 Dimension Tolerance:
7.3.1.1 Mill Run (Untrimmed) Sheetsâ€”The dimensional tolerance in the machine direction of untrimmed fiberboard sheets shall be âˆ’1â•„4 in. [6 mm] and +2 in. [50 mm]. The cross machine dimensions shall be not less than specified in 5.1.3.
7.3.1.2 Trimmed Sheetsâ€”The dimensional tolerances for trimmed fiberboard sheets shall be 61â•„8 in. [3 mm] for width and âˆ’1â•„8 in. [3 mm] and +1â•„2 in. [12 mm] for length. 7.3.1.3 Pads and Shapesâ€”The dimensional tolerances for all other materials made from fiberboard shall be 61â•„16 in. [2 mm] for dimensions under 18 in. [457 mm] and 61â•„8 in. [3 mm] for dimensions 18 in. [457 mm] and above, unless otherwise specified.

7.3.1.4 Scored Sheetsâ€”The center line of score to center line of score dimension, and the center line of score to sheet edge dimension shall be as specified 61â•„16 in. [2 mm], unless otherwise specified.

TABLE 2 Type CF (Corrugated Fiberboard), Weather-Resistant (WR) and Weather Resistant/Fire Retardant (WR/FR), and Water and Water Vapor Resistant Classes (WWVR)

Variety	Grade[A,B]	Basis Weight, lb/1000 ft² [g/m²], min	Bursting Strength, psi [kPa], min avg	
		Combined Weight of Facings	Dry	Wet[C]
SW	V3c	180 [878]	350 [2413]	150 [1034]
SW	W5c	124 [605]	275 [1896]	100 [689]
DW	V11c	270 [1318]	600 [4137]	300 [2068]
DW	V13c	180 [878]	400 [2758]	200 [1379]
DW	V15c	114 [557]	300 [2068]	100 [689]

[A] Includes WWVR grades.
[B] For doublewall fiberboard, the inner facing shall be the same thickness as the outer facing.
[C] After 24 h immersion (see 9.2).

TABLE 3 Type SF (Solid Fiberboard): Class Domestic (D) and Domestic/Fire Retardant (D/FR), All Grades

Grade	Combined Weight Of Plies Before Lamination, lb/1000ft² [g/m²], min	Bursting Strength, psi [kPa], min[A]
125	114 [557]	125 [862]
175	149 [727]	175 [1207]
200	190 [928]	200 [1379]
275	237 [1157]	275 [1896]
350	283 [1382]	350 [2413]
500	330 [1611]	500 [3447]
600	360 [1758]	600 [4137]

[A] Only one burst of the initial six may fall beneath the minimum required. Domestic board and domestic/fire retardant failing to pass this test will be accepted if, in a retest consisting of 24 bursts (12 from each side of the board), not more than 4 bursts fall below the minimum value required.

7.4 Glue Bond Separation of Weather-Resistant, Weather Resistant/Fire Retardant, Water, and Water-Vapor Resistant Classesâ€”The facings and corrugating mediums of corrugated fiberboard and the plies of solid fiberboard shall remain securely and continuously adhered to their contacting surfaces when tested as specified in 9.1.4. Edge separation shall not exceed 1â•„4 in. [6 mm] in depth.
7.4.1 Lamination of Pads and Cut Shapesâ€”The bonding agent used in the lamination process for fabricating pads and cut shapes shall be equal to or greater than the requirements of
7.4 and shall pass the tests specified therein.
7.5 Warpâ€”The amount of warp when received shall not exceed 1â•„2 in. when measured over a 2 ft span [12 mm/610 mm] when tested in accordance with 9.6.
7.6 Bending Requirements:
7.6.1 Numerous factors have significant impact on boxesâ€™ score fracturing/checking tendency, including fabrication, handling, and storage environment. A reasonable time frame for assessment of score fracture/checking should be agreed upon between the supplier and purchaser.
7.6.2 Unless otherwise specified, fibreboard shall show no continuous visual surface breaks of the plies, or split completely through, when folded as specified in 9.3 and applicable subparagraphs.
7.7 Fire Retardant Classâ€”When fire retardant class is specified, the requirements of 7.7.1 and 7.7.2 as tested by 9.1.6 and 9.1.7, respectively, shall be met.
7.7.1 Flame Spread Indexâ€”Tests shall be conducted in accordance with Test Method E162. Test

samples shall be exposed continuously to 95Â°F and 95 % relative humidity in a weathering test for seven days and subsequently conditioned in accordance with 8.2 to a constant weight prior to testing. A flame spread index of 20 or less is acceptable.
7.7.2 Specific Optical Densityâ€”Tests shall be conducted in accordance with Test Method E662. Test samples shall be exposed continuously to 95Â°F and 95 % relative humidity in a weathering test for seven days and subsequently conditioned in accordance with 8.2 to a constant weight prior to testing. A specific optical density of 100 or less is acceptable.

Test Methods
9.1 ASTM Standardsâ€”Conduct the tests in accordance with the following ASTM and TAPPI Standards:
9.1.1 Thicknessâ€”TAPPI T 411.
9.1.2 Basis Weightâ€”TAPPI T 410.
9.1.3 Puncture Resistanceâ€”TAPPI T 803.
9.1.4 Ply Separationâ€”TAPPI T 812.
9.1.5 Bursting Strengthâ€”TAPPI T 810.
9.1.6 Flame Spreadâ€”Test Method E162.
9.1.7 Specific Optical Densityâ€”Test Method E662.
9.1.8 Edge Crushâ€”TAPPI T 811.

9.2 Wet Burst Testâ€”For the wet burst test, the specimen shall be immersed in water as specified in the applicable paragraphs of TAPPI T 812 prior to performing the bursting strength test in accordance with TAPPI T 810.

9.3 Bending:
9.3.1 Apparatus:
9.3.1.1 Scoring Devices, on commercial production equipment having the proper profiles for the type, class, variety, and grade of fiberboard to be tested.
9.3.2 Test Specimenâ€”The specimen shall be 12 in. [300 mm] by 12 in. [300 mm].
9.3.3 Test Procedure:
9.3.3.1 Score the specimen using the proper scoring device both along and across the machine direction of the fiberboard. Cracks and ruptures occurring at the intersection of the scorelines shall be disregarded.
9.3.3.2 Degree of Bending:
(1) Singlewall corrugated fiberboard shall be folded 180Â°
toward the inner facing along scorelines.
(2) Doublewall corrugated fiberboard shall be folded 180Â°
toward the inner facing on scores parallel to the corrugations.
For scores perpendicular to the corrugations, the fiberboard shall be folded first 90Â° toward the outer facing, returned to the flat position, and then folded 90Â° toward the inner facing. (3) Solid fiberboard shall be folded 180Â° inward (male score) on scores parallel to the machine direction. Scores parallel to the cross direction shall be folded 90Â° outward (female), returned to the unfolded position, and then folded 90Â° inward.

9.4 Determination of the Amount of Polyethylene:

9.4.1 Test Specimenâ€”The specimen shall be 6 in. [150 mm] by 4 in. [100 mm] with each dimension having a 61â•„32 in. [1 mm] tolerance.

9.4.2 Test Procedureâ€”Soak the sample in a 2 % water solution of a wetting agent (Triton X-114 or equivalent). Peel the fibers away from the film with a firm rubbing action until only those fibers remain which are strongly adhered to the polyethylene film. To remove the remaining fiber, place the film in a shallow pan of Cupriethylendiamine, or hot (160 to 180Â°F [57 to 68Â°C]) zinc chloride solution (three parts zinc chloride to one part water). When the remaining fibers soften, they can be removed from the film by scraping it with a wooden spatula. When the film becomes clear, it shall be thoroughly washed in cold water and subsequently dried to constant weight. The weight of the film shall be determined accurately to the nearest 0.01 g. The weight of the film in lb/1000 ft2 is determined by multiplying the weight of the film in grams by 13.2. The weight of the film in g/m2 is determined by multiplying the weight of the film in grams by 64.6

9.5 Warpâ€”Measure warp by placing the blank fiberboard on a flat surface so that the bow rises between the ends of the blank. The maximum distance from the bottom of the sample to the flat surface shall then be measured. 9.6 Precision and Biasâ€”The precision and bias of the ASTM and TAPPI test methods are as stated by the individual methods. No justifiable statement can be made on the precision and bias of 9.3, 9.4, and 9.6.

Category

1. Equipment for Standards
2. Standards